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II. On the extensive Atmosphere of Mars. In a Letter to His Royal Highness the DUKE of SUSSEX, K.G., President of the Royal Society. By Sir JAMES SOUTH, F.R.S.

Read December 13, 1832.

THROUGH the kindness of your ROYAL HIGHNESS I had some time since the honour of calling the attention of astronomers to the "Extensive Atmosphere of Mars"—to the observations of those great men, from which its existence was inferred,—and I showed that they were either unsupported by, or were at variance with my own. Still, however, as the observations, of which mine seemed subversive, were bequeathed us by astronomers, to whom astronomy owes deep and lasting obligations, respect due to their memory demanded that I should rather enforce the necessity of further observations than treat the matter as actually decided.

This night has put me in possession of fresh evidence, and I lose no time in forwarding it to Your ROYAL HIGHNESS, in the hope that it may have the honour (should you, as President of the Royal Society, think it worthy,) of being presented by you for insertion in those journals, which contain so rich a mine of astronomical truths.

During twilight, in the field of the large Equatorial*, I saw a star of the

* This instrument, the design and work of Messrs. TROUGHTON and SIMMS, was executed by them in preference to the one hinted at by me, in a note appended to page 4 of the Phil. Trans. for 1826. It was erected in my observatory in the early part of the last year, and I fondly hoped, that long ere now I should have had the gratification of presenting an account of it to the Royal Society.

To my inexpressible grief, however, owing to its unfitness for the purposes for which it was designed, not only have fourteen months of a life advanced beyond its prime, been of necessity employed otherwise than in prosecuting those inquiries for which alone such an instrument was wanted; but at the present moment, as to when it will be fit for use, I have not data for offering even a conjecture.

In the mean time, fearing lest it should ultimately prove a total failure, during the last autumn I visited the Imperial Observatory of Dorpat, and I feel it due to the memory of the late Mr. FRAUNHOFER to hand down an apology through the same channel which conveyed the insinuation contained in the note before alluded to; inasmuch as a fortnight's residence under the roof of our celebrated

16 SIR JAMES SOUTH ON THE EXTENSIVE ATMOSPHERE OF MARS.

eighth or seventh magnitude, south preceding the planet Mars ; its place (approximately taken with the five-feet Equatorial) was right ascension, $3^{\text{h}} 29^{\text{m}} 19^{\text{s}}$, and its northern declination about $20^{\circ} 22'$; as additional identification, it was found to precede a star of the seventh or sixth magnitude, about five minutes twenty-six seconds and five tenths, and was about one minute and forty-eight seconds of a degree south of it. These preliminaries settled, the night became cloudy ; but at about three hours and a half sidereal time, the sky being clear, on directing the instrument to Mars, the planet was seen somewhat more than half a minute from the star. The star, as previously noticed, was of a light blue colour, afforded a pleasing contrast with that of the planet, and was tolerably steady ; the planet's limb extremely unsteady. The object-glass of the large Equatorial is 11.85 inches in its clear aperture, and has nearly nineteen feet focus. It has two finders, the one a telescope of 4.40 inches aperture, and five feet focal length ; the other 2.75 inches diameter, and forty-two inches focus. They are placed parallel with the tube of the large object-glass, so that the same sidereal object presents itself in the centre of the fields of the three telescopes, at the same moment. The object-glasses of all the three are very perfect ; and taking them in the order of their diameters, beginning with the largest, they were supplied with powers of 520, 250, and 120; and that the observations might not be vitiated by the unsteadiness of the polar axis, cylinders of wood were placed east and west of the large telescope, so that toward their upper extremities, they rested against that telescope's tube, whilst their lower ends were on the observatory floor. The five-feet Equatorial also was placed upon the planet with a power of 133 only. With this instrument the star was seen by one observer, till the planet's limb had reached it ; with the large finder of the large Equatorial, another observer saw it, till a small segment of its disk had been cut off by the planet's limb ; whilst with the small one it was distinguishable when not more than three seconds of a de-

Associate STRUVE, has not only demonstrated that FRAUNHOFER must ever be regarded as an optician of the highest order, but that he merits our profound respect as a most powerful mechanician.

In short, such is my admiration of, I had almost said veneration for, the Dorpat Equatorial, I shall to the latest hour of my life regret, that the conditions on which the great man who made it, would have provided me with one still more powerful, I was, as stated in the note in question, imprudent enough to reject.

Observatory, Kensington, March 26, 1833.

gree distant from it. But although the planet's approach to the star was observed with the several telescopes, it is to the large Equatorial only that we must refer, with the reasonable hope of detecting any minute optical change which the star might apparently undergo.

No such phenomenon however occurred; for the star retained its light blue colour and comparative steadiness till the very instant of its occultation, which took place at $4^{\text{h}}\ 32^{\text{m}}\ 24^{\text{s}}\cdot7$; nor did its splendour suffer any diminution prior to disappearance, except what may fairly be attributed to the light of the planet. I saw not the slightest projection of the star upon the planet's disk.

Again, at the emersion, which happened at $4^{\text{h}}\ 50^{\text{m}}\ 41^{\text{s}}\cdot7$, the star with the large equatorial telescope was seen neatly dichotomised; with the large finder it was detected before the planet's disk had separated from it; by the five feet Equatorial, when it was still clinging to it; and by the small finder when it was not more than three seconds distant. With the large telescope it was watched with the greatest attention, at, and for some time subsequent to the emersion; and I feel confident that not anything remarkable occurred, any more than at and previously to the immersion. The planet had passed his opposition nine days.

Reflecting on these facts and on those I have before presented to your ROYAL HIGHNESS, I can arrive at no other conclusion than that either some physical change has occurred in the "Extensive Atmosphere of Mars," or that the accuracy of the observations of CASSINI and of ROËMER must be regarded as untenable.

*Observatory, Kensington,
Nov. 29, 1832.*